

UNEB U.C.E MATHEMATICS (PAPER 1) 2016

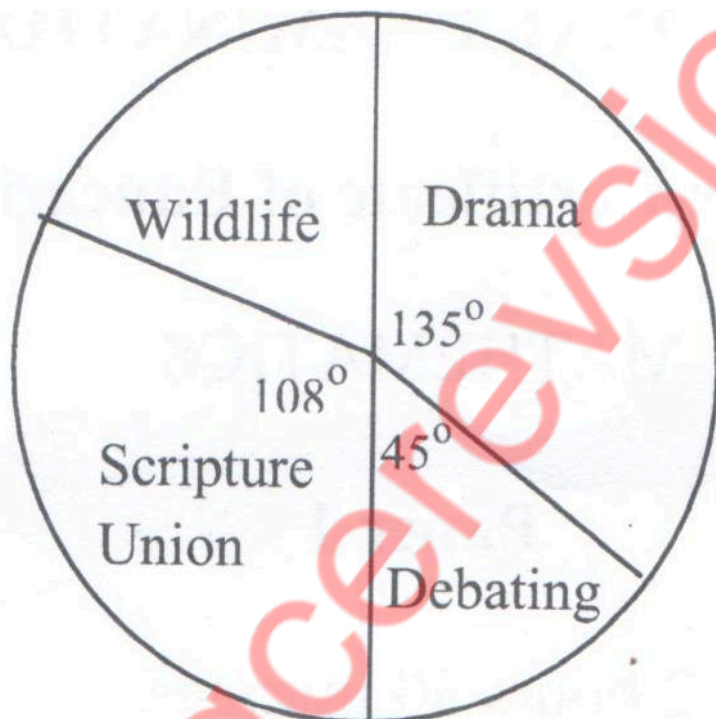
SECTION A

Answer all questions in this section

1. Make a the subject of the expression

$$c = \frac{a^2}{(a-b)(a+b)}$$

2. The pie chart below shows the various clubs that 40 students belong to:



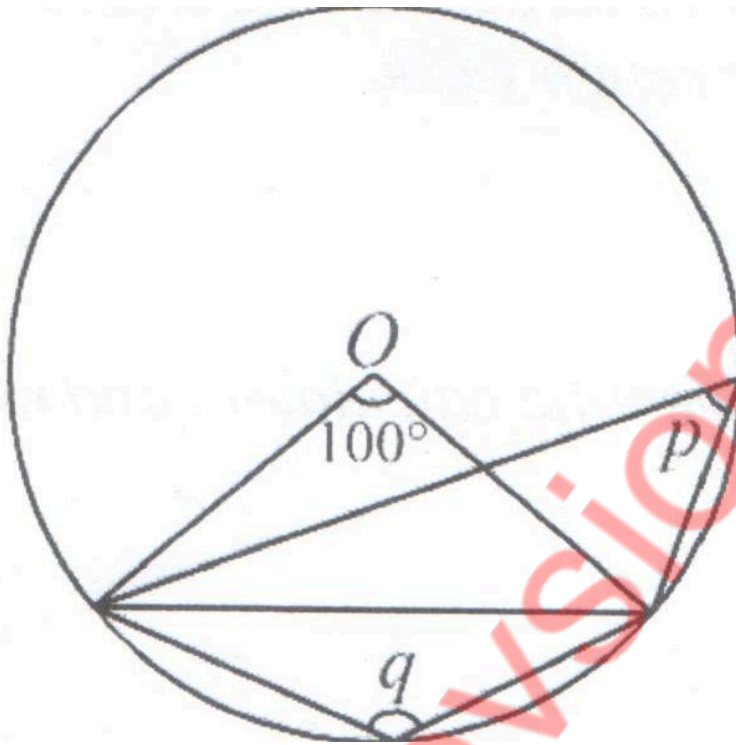
Determine the number of students in the wildlife club.

3. Given that $a * b = a + b + ab$

a) evaluate $3 * 5$

b) find the value of n , when $7 * n = 23$.

4. The circle below has its centre at O



Calculate angles p and q .

5. An object at $(0,0)$ undergoes a translation

$A = \begin{pmatrix} 5 \\ -12 \end{pmatrix}$ then followed by translation $B = \begin{pmatrix} 3 \\ 6 \end{pmatrix}$.

a) Find a single translation equivalent to the two translations A and B .

b) How far is the object from $(0, 0)$?

6. Solve the equation

$$\frac{5x+2}{3} - \frac{7x+2}{5} = 2$$

7. Two fair coins are tossed.

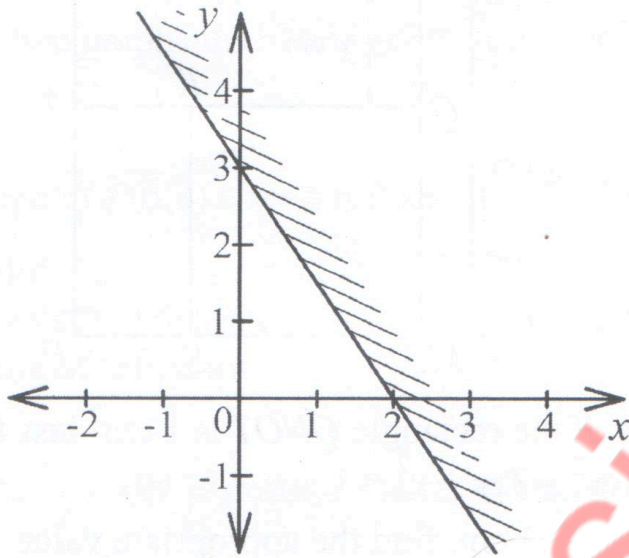
a) Construct a table showing all the possible outcomes.

b) What is the probability of getting at least a tail?

8. Find the inverse of the matrix

$$A = \begin{pmatrix} 5 & 7 \\ -3 & -2 \end{pmatrix}.$$

9. Determine the inequality which is represented by the unshaded region on the graph below.



10. A pilot in a plane at an altitude of 500m above the horizontal ground sees a camp at an angle of depression of 15° . Find the horizontal distance the pilot would have to fly so that the plane is directly above the camp.

SECTION B

Answer any five questions from this section.

11. A manager of a restaurant spent Shs29,000 to purchase 4kg of rice and 7kg of irish potatoes. Later he increased each of the above quantities by 1kg thus increasing his expenditure by Shs5000.

- Write down two equations that represent the manager's purchases.
- Use your equations to find the cost of rice and irish potatoes per kilogramme.
- How much would the manager pay for 10kg of rice and 15kg of irish potatoes?

12. a) Solve the equation

$$3\left(\frac{1+x}{y}\right) - \left(\frac{x}{1-2y}\right) = \left(\frac{5}{9}\right)$$

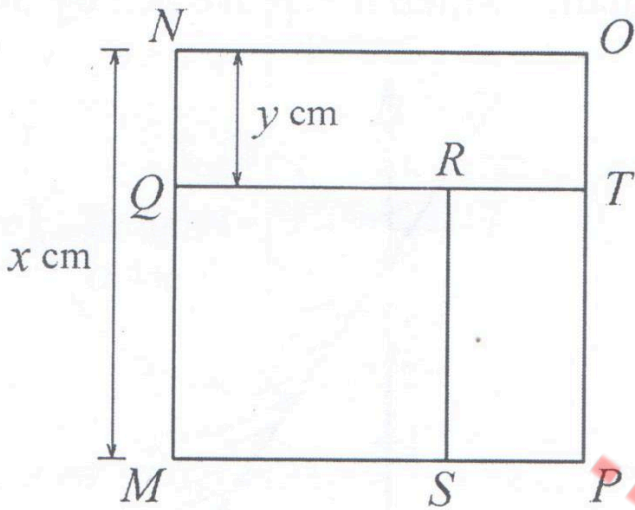
- b) Given that

$$\mathbf{M} = \begin{pmatrix} 0 & 1 \\ 3 & 0 \end{pmatrix} \text{ and } \mathbf{N} = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix};$$

- calculate \mathbf{N}^2 and \mathbf{MN}

- find the value of the scalar k if $\mathbf{N}^2 + k\mathbf{N} = \mathbf{MN}$.

13. In the figure below, MNOP and MQRS are squares. $MN = x\text{cm}$ and $QN = y\text{cm}$.



- a) If the area of the rectangle $QNOT$ is 1cm^2 less than area of $MQRS$ show that $y^2 - 3xy + x^2 = 1$.
 Given that $y = 3\text{ cm}$, find the appropriate value of x .
 Calculate the area of rectangle $PTRS$.
 The following table shows the marks scored by 36 students in a Mathematics test.

Marks	Frequency
30 - 39	4
40 - 49	6
50 - 59	3
60 - 69	12
70 - 79	2
80 - 89	5
90 - 99	4

- a) Calculate to 2 decimal places the
 i) mean mark
 ii) median mark
 b) Find the probability that a student picked at random scored below 50.

15. a) Copy and complete the table below for $y = (3x + 1)(2x - 5)$

x	-1	0	1	2	3	4
$3x + 1$	-2		4		10	
$2x - 5$	-7		-3		1	

y	14		-12		10	
---	----	--	-----	--	----	--

b) Use your completed table to draw a graph of $y = (3x+1)(2x-5)$ with a scale of 2cm for 1 unit on the x -axis and 2 cm for 5 units on the y -axis.

c) Draw on the same axes the line $y=5$.

d) Use the two graphs in (b) and (c) to solve the equation $6x^2 - 13x - 10 = 0$

16. a) The image of P (6, 3) after a reflection is P#(3, 6)

i) Plot the points P and P# on a graph paper.

ii) Construct the line of reflection. Hence find the equation of the line of reflection.

b) The image of ABCD under a matrix of transformation

is A#B#C#D#. The coordinates of the image are A#(1, 0), B#(4, -6) C#(4, -4) and D#(1, 2). Determine the coordinates of A, B, C and D.

The manager of a cinema hall wishes to divide the seats available into two classes executive and ordinary. There are not more than 120 seats available. There must be at least twice as many ordinary seats as there are executive seats. Executive seats are priced at Shs15,000 each. Ordinary seats are priced at Shs10,000 each. At least Shs 1,000,000 should be collected at each show to meet the expenses.

a) Taking x as the number of executive seats and y as the number of ordinary seats, write down five inequalities

$$\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$$

from the given information.

b) Represent the inequalities on a graph.

c) From your graph, find the number of seats of each kind which must be sold to give the maximum profit.